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### NINTH SESSION OF THE INTERNATIONAL COMMISSION FOR UNIFORM METHODS OF SUGAR ANALYSIS

The ninth session of the International Commission for Uniform Methods of Sugar Analysis was held at the Institute for Chemistry, London, August 31 to September 5 under the presidency of Frederick Bates of this Bureau. Over 100 delegates, representing nearly all of the sugar-producing countries of the world, were in attendance, including representatives from Australia, Mauritius, and Hawaii. The program comprised the following 16 subjects:

1. Constitution and bylaws.
2. Weighing, sampling, and classification of sugars.
3. Conductometric determination of the ash content of raw sugars.
4. Determination of reducing sugars.
5. Determination of the decolorizing power and filtering quality of chars.
6. Testing of molasses.
7. Application of refractometric methods to sugar analysis.
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13. Colorimetry in the sugar industry.
14. Values of Clergent divisors.
15. Determination of moisture.
16. Determination of the hydrogen-ion concentration.

In addition to the president of the commission, two other members of the Bureau's polarimetry section attended the session: J. F. Brewster and C. F. Snyder. The sessions were conducted in English, French, and German, although 16 different languages were represented among the delegates. The Bureau's representatives acted in the capacities of either referee or associate referee on a number of the subjects in the preceding paragraph.

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One of the most important features of the session was the Bureau's paper on the French Sugar Scale. This scale is used to a considerable extent in France, Belgium, and certain colonial possessions. There have long been two groups among French physicists who were deadlocked on what physical values should be used in the standardization of the French Sugar Scale. In the present paper, the Bureau was able to demonstrate that the view of neither of these groups was the correct one. It now appears as though the National Bureau of Standards' value for the French Sugar Scale will be adopted officially in France, thereby bringing the French scale into agreement with the International Sugar Scale. The latter is the National Bureau of Standards Scale, which was adopted by the International Commission for Uniform Methods of Sugar Analysis at Amsterdam in 1932.

The tenth session of the Commission will be held in Berlin in 1940.

### TWELFTH CONFERENCE OF THE UNION INTERNATIONALE DE CHIMIE

At the request of the National Academy of Sciences and the National Research Council, Frederick Bates attended the twelfth conference of the Union Internationale de Chimie as a delegate of these organizations. This session was held at Lucerne and lasted throughout the week of August 16. The American delegation was headed by Professor Bartow, president of the American Chemical Society, and consisted of six members. The Council of the Union Internationale de Chimie proposed to alter the constitution of the Union in order that the International Commission for Uniform Methods of Sugar Analysis might become an integral part of the Union and still have complete autonomy in promulgating its findings. The Commission unanimously rejected the proposition that it become affiliated with the Union Internationale de Chimie. However, there are other scientific organizations which may take advantage of the invitation of the Union Internationale de Chimie to affiliate with it.

### AIR FLOW IN THE BOUNDARY LAYER NEAR A PLATE

Modern aerodynamic and hydrodynamic theory makes much use of the concept of the boundary layer, a thin film adjacent to the surface of a body immersed in a fluid stream, within which the effect of viscosity becomes predominant and the speed of flow decreases to zero. This concept, developed by Prandtl of Göttingen, Germany, in 1904, became widely accepted when experimental technique developed to the point where the speed distribution within the layer could be explored in detail. The pioneer measurements were made by Burgers and v. d. Hegge Zijnen in 1924 with the aid of a hot-wire anemometer.

These measurements show that near the leading edge of a plate set parallel to the flow the distribution of speed corresponds to the theoretical calculations of Blasius for laminar flow. At a definite value of the Reynolds number (the ratio of the product of speed of the stream by the distance from the leading edge, to the kinematic viscosity of the fluid) the distribution changes to a type which has not so far been computed theoretically but which corresponds to the distribution observed in fully developed turbulent flow in pipes.

In cooperation with the National Advisory Committee for Aeronautics, H. L. Dryden at the Bureau reviewed the published data, both experimental and theoretical, on the air flow in the boundary layer near a flat plate set parallel to the flow, and has made additional measurements. In these measurements, the amplitude of the fluctuations of speed were measured as well as the mean speed. The transition from laminar to fully developed turbulent flow was studied in detail. The Reynolds number at which transition occurs is a function of the initial turbulence of the air stream, decreasing from about 1,100,000 to 100,000 as the turbulence is increased from 0.5 to 3 percent of the mean speed.

The transition proved to be a sudden phenomenon, but the point of transition moved rapidly back and forth about an average position. In the transition region, intermittent breakdown of the laminar flow was observed, the intervals between the breakdowns at a fixed air speed and varying distance from the leading edge decreasing as the distance increases from the front to the rear of the transition region.

The laminar region exhibited comparatively large fluctuations of speed induced by the turbulence of the general flow. The laminar and fully developed turbulent regions cannot be distinguished on the basis of the magnitude of the speed fluctuation, but the principal fluctuations in the eddying region are of higher frequency than those occurring in the laminar region.

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Further experiments are needed on the effect of pressure gradients, curvature, and roughness on the transition. The solution of many problems of great importance to aircraft designers, especially the influence of initial turbulence and scale effect, depends on a more complete knowledge of the flow near the surfaces of bodies, i. e., in boundary layers.

The complete report of this work has just been published as Technical Report 562 of the National Advisory Committee for Aeronautics. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

### PRESSURE LOSSES FOR FLUID FLOW IN CURVED PIPES

When a fluid flows through a straight pipe, there always occurs a loss of energy resulting from friction at the wall which manifests itself as a drop in pressure along the pipe. If now the fluid flows around a bend in a pipe line, this drop in pressure is increased, because the stream filaments are no longer straight lines, but wind and twist about, producing eddies in the flow which increase the frictional resistance. Consequently the existence of bends in a pipe line either increases the cost of pumping or requires a larger, and therefore a more expensive, line than would be the case if the pipe were straight.

Hence a knowledge of the laws of pressure loss at pipe bends has a definite economic importance, since it makes possible the selection of the most efficient bends for any particular conditions and it permits the designer of a pipe line to balance increased cost of pumping against increased first cost of line to obtain the best economic result. Such information has many and varied applications; for example, in the flow of steam in power and heating mains, the flow of oil in transmission lines, the flow of water in the water mains of large cities, in the supply systems of buildings, and in large irrigation conduits, and to mention a widely different application, the flow of refrigerants in cooling coils.

At present there is no general method available for computing the pressure loss at pipe bends. Instead, experimental coefficients have been obtained for certain conditions, and these have been interpolated and extrapolated to meet other conditions. RP965 in the January number of the Journal of Research presents formulas (based on tests by G. H. Keulegan and K. Hilding Beij, of the Bureau's hydraulic laboratory, using ⅜-inch brass pipe) for computing these losses accurately under the following conditions: (1) the radius of curvature of the bend is large in comparison with the diameter of the pipe; (2) the walls of the pipe are smooth; and (3) the flow is nonturbulent. Although the formulas were obtained from tests on small pipes, they are not limited in their application to such pipes, but can be used for pipes of any size.

### SATURATION BY WATER IN GAS ANALYSIS COMPENSATORS

An experimental study was recently made by Joseph R. Branham of the pressure-temperature compensating system generally employed in volumetric gas analysis, with respect to the saturation of the gas confined in the compensator. The difference of pressure between a burette with a film of water covering its inner surface, and two compensators, in which visible water was present only in the bottom, was measured as the temperature of the system was changed.

When the compensator, connected to the burette by a water manometer, consisted of two bulbs joined by narrow tubes, the rate of travel of water vapor up the tube was extremely slow and did not appreciably affect the total pressure in this side of the apparatus. Below a certain temperature, which depended on the amount of water adsorbed on the walls of the compensator and the humidity of the air initially admitted to the compensator, the total pressure in the burette and compensator remained nearly equal. Above this temperature large differences in pressure developed between the two vessels even when the rate of change of temperature was less than 0.01° C. per minute. When a wide cylinder was substituted for the bulbed compensator there was no significant difference of pressure between the cylinder and the burette when the rate of change of temperature was nearly 0.4° per minute.

RP962 in the January number of the Journal of Research discloses one of the errors that may be present in gas analysis apparatus employing the pressure-temperature compensator. It was found that a large error occurs in the use of some standard types of gas analysis apparatus where extreme accuracy is required and was believed to have been obtained. In many cases the design of such apparatus should be modified.

### DETERIORATION OF CHROMIC ACID BATHS USED FOR ANODIC OXIDATION OF ALUMINUM ALLOYS

Commercial practice has shown that chromic acid baths for anodizing aluminum eventually fail. R. W. Buzzard and J. H. Wilson in the January number of the Journal of Research (RP961) show that aluminum and chromium compounds are the controlling factors in the bath breakdown. They found that the film quality is dependent on the available or free chromic acid. Control of the pH of the bath by chronic acid additions is a very good method of holding the free chromic acid concentration at a desired value.

### ANODIC COATING OF MAGNESIUM ALLOYS

Magnesium alloys have a marked susceptibility to corrosive attack under saline conditions, and protective mechanical coatings applied to their surfaces have a low degree of adherence. Previous attempts to improve these conditions by chemical treatment have led to the development of (1) the chrome-pickle treatment, which furnishes good corrosion protection and is an excellent paint base, but cannot be used on machined parts, as it materially reduces the cross section, and (2) the alkaline chromate treatment, which can be used on machined surfaces, but has been found to give inferior corrosion protection.

An anodic process recently perfected by R. W. Buzzard and J. H. Wilson and described in the January number of the Journal of Research (RP964), does not reduce the cross section materially and gives corrosion protection and paint adhesion equivalent to that afforded by the chrome pickle. The part to be anodized is first cleaned in an electrolytic bath of sodium carbonate and trisodium phosphate, and is then made the anode in a bath containing 10 percent of sodium dichromate and from 2 to 5 percent of monosodium phosphate. The anodic film may be applied over a wide range of current density and temperature, but the most satisfactory results have been obtained with 5 to 10 amperes per square foot at 50° C.

Salt spray tests have shown that the anodic film serves both as a corrosion inhibitor and a paint base.

### CORROSION TESTS OF WELDED LOW-CARBON STAINLESS STEEL

Laboratory tests are frequently used to determine the resistance of a material to corrosion under certain conditions. The value of these tests as an indication of the future behavior of materials in service depends largely upon the type of service and upon the interpretation of the results.

Several methods have been proposed for testing stainless steels, some of which are embodied in specifications for these materials. Three methods have been investigated recently by George A. Ellinger and Leon C. Bibber of the Bureau's Metallurgical Division, in connection with the welding of stainless steel containing about 0.06 percent of carbon.

A solution of copper sulphate in sulphuric acid did not noticeably attack either plate or weld metal that had been heated to any temperature, although this reagent has been reported to cause intergranular corrosion in stainless steels of higher carbon content.

Concentrated nitric acid was found to attack carbides which had been localized at grain boundaries. The acid attack destroyed the cohesion between the grains by dissolving or decomposing the carbides, thus allowing the grains to become loosened and ultimately to fall away from the material. This type of attack was found only in plate metal which had been heated to 650° C and which contained carbides localized at the grain boundaries. Carbides in weld metal were usually found in areas of delta ferrite and not in the grain boundaries, regardless of heat treatment; consequently the attack by nitric acid on weld metal was slight.

A solution of hydrochloric acid and water (equal parts) attacked the plate metal severely. Heat treatment of the plate did not appreciably change this rate of attack. Weld metal that was not heat treated was attacked at approximately the same rate as plate metal. After annealing at either 650° C or 980° C, weld metal was more resistant to attack than plate metal.

The complete report on this investigation will be published as RP963 in the Journal of Research for January.

### THERMAL EXPANSION OF CEMENTED TUNGSTEN CARBIDE

RP960 in the Journal of Research for January, will give data on the linear thermal expansion of tungsten carbide-cobalt mixtures containing about 6 to 13 percent of cobalt, as determined by Peter Hidnert of the Bureau's Thermal Expansivity Section. These products called "cemented tungsten carbide" or Carboloy in the United

States and Widia in Germany, are used in cutting a wide range of materials. Observations were made at various temperatures between 20° and 40° C and the following conclusions were drawn from the results:

1. The average coefficient of expansion of cemented tungsten carbide containing 5.9 percent of cobalt, increases from $4.4\times10^{-6}$ for the range between 20° to 60° C, to $5.9\times10^{-6}$ for the range between 300° and 400° C.

2. The average coefficients of expansion of the samples of cemented tungsten carbide containing from 12.9 to 13.2 percent of cobalt, increase from $5.0\times10^{-6}$ for the range between 20° and 60° C, to $6.7\times10^{-6}$ for the range between 300° and 400° C.

3. For the range from 20° to 400° C, the average coefficients of expansion of the samples of cemented tungsten carbide containing about 13 percent of cobalt are 15 percent greater than the coefficient of expansion of the cemented tungsten carbide containing about 6 percent of cobalt.

4. The rates of expansion of the samples of cemented tungsten carbide increase linearly with temperature. The rates of expansion of the cemented tungsten carbide containing 13.0 percent of cobalt are greater than the rates for the carbide containing 5.9 percent of cobalt. The rates of expansion of the samples of cemented tungsten carbide are greater than the rates of expansion of tungsten, and considerably less than the rates of expansion of cobalt.

### INFRARED RADIATION FROM OTTO CYCLE ENGINE EXPLOSIONS

The paper by Sidney Steel, Armistead Wharton, and C. H. Roeder, reviewed under the above title on page 121 of Technical News Bulletin 224 (December 1935), appeared in the January 31, 1936 issue of Engineering (London, England) and was followed in a later issue by an analysis and discussion of the data, completed by the senior author after leaving the Bureau. The complete paper has recently been issued as Publication no. 188 from the Graduate School of Engineering of Harvard University. (A limited number of copies are available. Applications should be made either to the Graduate School or to the senior author in care of the National Bureau of Standards.)

### METHODS OF DETERMINING GLOSS

For those who are interested in gloss as it affects the appearance of different materials, a paper in the January number of the Journal of Research (RP958) by Richard S. Hunter will be of interest because it brings together much of the available information based upon gloss and discusses certain phases of the subject which have not heretofore received attention.

Glossiness is a characteristic common to many materials encountered in everyday life and is caused by surface reflection. Because surfaces are of so many types structurally, many kinds of glossy appearance are possible. The fundamental physical basis for describing the gloss of surfaces is provided by functions which describe the directional distributions of light reflected by these surfaces. However, such distribution functions are quite complex and, although they supply much more information about the reflectance properties of surfaces than do gloss determinations which give individual, arbitrary gloss values, they do not provide a practical means for the routine examination of the gloss of products in industry and commerce. What are desired for "practical" measurements of gloss are instruments which give a single value of gloss for each surface measured.

If one studies the different types of glossy appearance, or if one examines the difference instruments which are used to measure gloss, he discovers that there are several types of gloss. Six types of gloss have so far been described. They are: (1) specular gloss (shininess); (2) sheen (shininess at grazing angles); (3) contrast gloss (contrasts between high-light areas and nonhigh-light areas); (4) absence-of-bloom gloss (bloom is the reflection haze adjacent to reflected high lights); (5) distinctness-of-reflected-image gloss; and (6) surface smoothness (absence-of-surface texture). Materials which are graded for gloss are usually evaluated in terms of one or another of these types of gloss. When one grades a series of samples for gloss, he unconsciously searches out and uses the appearance characteristic in which the differences are most noticeable. The six types of gloss identify six of these appearance characteristics.

The applicability of any instrument to a given gloss problem is best determined by actual trial in which comparisons are made between visual estimates of gloss and results obtained with the trial instrument on samples typical of the materials to be measured. Specular gloss measurements are most useful in the medium-gloss range, and measurements of distinctness-of-reflected-image gloss on samples in the high-gloss range. Instruments have

not as yet been developed to measure bloom. Surface texture is best recorded by actual photographs of surfaces in specularly reflected light.

In the paper a number of gloss instruments are described and a bibliography is included which lists most of the previous publications on the subject.

### MICROBURETTE FOR TESTING THE ABSORPTIVENESS OF THIN PAPER

A new instrument, known as a microburette, has been designed by F. T. Carson, of the Bureau's Paper Section, to test the absorptive quality of thin papers, such as tissues. The instrument, which will be fully described in the January number of the Journal of Research (RP959), consists of a capillary tube, with a sliding index, mounted on a pivoted support in such manner that it can be adjusted to any angle of inclination. Increasing the slope an appropriate amount causes the water column in the capillary to move the length of the slider, and thereby to displace a correspondingly accurately measured volume that hangs as a drop from the discharge tip. The drop of water is then taken off on the paper to be tested by pressing down a lever, and the time of absorption is measured with a stop watch.

The drop of water ordinarily dispensed in making a test with this instrument is about the size of a BB shot. Notwithstanding its small size, this volume of water is repeatedly measured and dispensed with an uncertainty of only a very few parts in a hundred. Although designed particularly for the testing of paper, the microburette may find other uses involving the precise dispensing of small amounts of liquids.

### TESTING WOMEN'S COTTON AND RAYON GLOVES

The General Federation of Women's Clubs requested the Bureau to develop tests for women's washable cotton gloves for use in the establishment of minimum standards of quality. Work was undertaken on methods for determining (1) shrinkage due to laundering; (2) strength of seams; and (3) resistance to abrasion. The resulting methods are described below.

Shrinkage was found by measuring certain dimensions of the glove before and after laundering, with the glove lying flat in an unstretched condition; and also by measuring certain dimensions before and after laundering, with the glove filled with 5 pounds of lead shot and suspended in a vertical position with the fingers downward. A third and probably more suitable method is proposed whereby the glove is mounted on a polished metal hand of proper size and the dimensions measured, both before and after laundering the glove.

The seam strength is determined by the ordinary grab test, modified by using ½ inch between the jaws instead of the usual 3 inches.

Resistance to abrasion is found by rubbing a flat circular area of glove fabric under a known load across abrasive paper with a reciprocating linear motion.

The results of shrinkage tests suggest that numerical limits for shrinkage may not be necessary. The data given afford some basis for selecting tentative minimum values for seam strength and resistance to abrasion for purposes of discussion, but tests of many more gloves would be necessary to establish minimum standards on a sound basis.

### TEXTILE TESTING IN RELATION TO CHEMICAL PROCESSING AND USE

The following is an abstract of an address by William D. Appel, chief of the Bureau's Textile Section, before the Toronto Chemical Association at Toronto, Canada, on December 7, 1936.

Textile testing has undergone a marked change in recent years, largely as a result of the applications of chemistry and chemical engineering in the textile industry. Since the World War, several types of rayons, which differ in form, appearance, and properties, have come into general use. Mixtures of two and sometimes more of the major fibers have become common. New dyes, giving a wider range of colors, dyeing properties, and color fastness have been developed. New softening, stiffening, weighting, coating, proofing, and other agents and processes have been applied to fibers, yarns, and fabrics, in order to modify their properties and make the finished products more attractive and more useful. Further, the uses for textiles have become more varied, more specialized, and more exacting in their requirements. These developments have made it difficult if not impossible to judge the serviceability of textiles adequately from their constructions and compositions. Users are no longer concerned so much with how and of what textiles are made as they are with what textiles will do. There has arisen a need for means to test the perform-

ance or serviceability of textiles. (See preceding item.)

Some of the problems of textile testing, which have been studied at the Bureau from the point of view of the user of textiles, include: How to determine whether a colored material has adequate fastness to light; whether a silk, particularly a weighted silk, will deteriorate rapidly or will give reasonable service; whether a wool textile is exceptionally susceptible to deteriorative influences; the evaluation of resiliency, ability to drape, and resistance to creasing and crushing of a fabric.

Machines have been developed at the Bureau for testing the performance of carpets and rugs, hosiery, coated fabrics, window-sash cord, and shoes. Some of the more interesting results obtained with these machines are as follows: In accelerated tests, a window-sash cord containing wax lasted nearly ten times as long as the same cord without wax; rugs wore from 1½ to 2½ times as long when placed over a resilient underlay as when the underlay was not used; the index of wear of rugs given by the machine correlated well with the density of the pile, but if the wool in the pile had been overbleached the rug wore out rapidly; the upper part of the leg of some silk stockings could be distended several thousand times, in a way simulating use, without developing holes or runs or bagginess, but other stockings failed in these respects when distended less than 100 times; some of the finishes applied to silk stockings to improve their appearance had a deleterious effect upon their performance.

Textile chemists and users of textiles have an interest in common in the performance type of testing. Both are concerned with the three factors which govern the suitability of textiles for particular uses: *Cost*, *serviceability*, and *appeal*. The chemist is constantly striving to lower costs, to increase serviceability, and to create new appeal in such characteristics of textiles as appearance, color, feel, and style, by chemical means. Laboratory performance tests can serve him as a guide in this work. They can be used to control processes and standardize products. When used in these ways, performance tests serve the user of textiles indirectly. They will be of the greatest help to users of textiles when they are incorporated in nationally accepted standards for the certification to the user of the serviceability of the textiles he buys.

## SIMPLIFICATION OF WEIGHTS AND WIDTHS OF COTTON DUCK

Simplified Practice Recommendation R27–36, Cotton Duck, is the second revision of this program, which covers a simplified schedule of numbers and widths of sail and wide cotton duck. It became effective November 1, 1936.

This project was initiated in 1924 by members of the Cotton Duck Association with the appointment of a committee to make a survey of production and demand as a basis for determining which items could advantageously be eliminated. At the same time the assistance of the Division of Simplified Practice of the Department of Commerce was requested in the establishment of a simplified practice program for this commodity.

A general conference, attended by representatives of manufacturers, distributors, and users of cotton duck, was held in Washington on September 17, 1924. The results of the above survey were presented, and revealed that 460 different weights and widths of cotton duck were being produced at that time. A proposed schedule was submitted reducing the 460 fabrics to 280, within the range from 22 to 144 inches in width. Of these 280 fabrics, the survey disclosed that 87 would take care of 80 percent of normal requirements.

Following a general discussion, the conference unanimously accepted a recommendation listing the 87 regular fabrics proposed by the committee, and in addition, 7 others, making a total of 94 in this group. These regular, or standard fabrics, were the only ones to be carried in stock. The 7 additional regular fabrics, together with 29 specials, were included to take care of the laundry industry's requirements for cotton duck for use on ironing machines. This brought the total number of fabrics listed to 316, including both standards and specials. The specials were to be made up on order only, in units of not less than 500 yards, and their manufacture was to be restricted, as far as possible, to units of 1,500 yards, as representing the minimum at which operating efficiency is obtainable. The schedule was made effective from November 1, 1924.

The schedule in its original form was reaffirmed in January 1926. In January 1927 the standing committee approved a revision which resulted in a further net reduction of four items, and in 1929 reaffirmed the revised program, repeating this action in 1931, and again in 1933.

The present revision, which the standing committee approved in May 1936 to bring the schedule into conformity with current practice in the industry, adds four items to the simplified list. The revised issue will include, in addition to the list of standard numbers and widths, a master list showing these standard fabrics as well as the special fabrics, also a statement of the development of the project, those present at the general conference, and the present members of the standing committee.

Until printed copies are available, free mimeographed copies of the revision may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

### SIMPLIFICATION OF BOX BOARD THICKNESSES

Simplified Practice Recommendation R44–36, Box Board Thicknesses, is the first revision of this recommendation, and became effective on December 31, 1936. The program was adopted originally in July 1925 by a general conference of manufacturers, distributors, and users of box board. It went into effect on October 1, 1925, and was reaffirmed without change in November 1927.

The initial steps in the establishment of this recommendation were taken in 1924, when preliminary conferences were held between representatives of the manufacturing and consuming groups. At these meetings the desirability of eliminating a number of the thicknesses of box board was emphasized. It was pointed out that in many cases the variations in thickness were so small as to have practically no significance from the standpoint of utility, strength, durability, and appearance. A simplification committee was appointed to make a survey of existing conditions and to prepare a schedule of standards for submission to the industry. On July 1, 1925, the industry requested the Division of Simplified Practice to call a general conference of all concerned to consider and act on the proposed simplified list. The general conference (held in New York City on July 29, 1925) was attended by representatives of all groups interested. A representative of the Division of Simplified Practice reviewed the development of the project and pointed out that the recommendations of the simplification committee would mean a reduction from 244 to 60 in the number of thicknesses of box board produced, or an elimination of 75 percent. After thorough consideration and discussion, the conference unanimously adopted the gage lists as shown in the original issue of the recommendation.

The present revision, containing eight gage lists giving standard thicknesses of the various types of box board, was approved by the standing committee in August 1936. The lists conform to the current standards of the National Paperboard Association and cover certain changes in thickness to meet present requirements. For completeness, definitions of the terms used in the gage lists are given. In addition, the tables have been extended to show the weight per thousand square feet of the kinds of board covered. A gage list for pasted solid news board replaces one for container board appearing in the first issue. The new edition also contains a brief history of the project, a list of those attending the general conference, and the present personnel of the standing committee.

Until printed copies are available, free copies of the revision in mimeographed form may be obtained from the Division of Simplified Practice, National Bureau of Standards.

### COMMERCIAL STANDARD FOR STAPLE VITREOUS CHINA PLUMBING FIXTURES

The Bureau recently released the second edition of Commercial Standard CS20–36, Staple Vitreous China Plumbing Fixtures. The first edition of this commercial standard was published in 1930, superseding Simplified Practice Recommendation R52. The standard records accepted nomenclature, definitions, grading rules, types, dimensional standards, methods of marking and labeling, recommended practices, and limitations of variety of staple vitreous china plumbing fixtures such as water-closet bowls, tanks, lavatories, urinals, and service sinks.

Experience of the industry under the provisions of the first edition indicated the desirability of changing the term "regular selection" to "first quality" in describing ware formerly known as "Grade A" for which no specific limitations of grade were established.

The second edition includes several new items, such as service sinks and top contour for elongated water-closet bowls; adds some new definitions; and provides for definite and legally binding wording of labels to certify quality of the ware and conformity to dimensional standards.

The chief purposes of the voluntary standard are to provide a better basis

of understanding between buyer and seller as to grades, requirements for dimensional interchangeability, sanitation, elimination of back siphonage, methods of inspection and marking of these most important parts of modern plumbing systems. In addition to the manufacturers and distributors, this recorded standard of the industry is of primary interest to master plumbers, architects, and builders. Copies of the publication are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

### COMMERCIAL STANDARD FOR INTERCHANGEABLE GROUND-GLASS JOINTS, STOPCOCKS, AND STOPPERS

The Bureau recently released Commercial Standard CS21–36, Interchangeable Ground-Glass Joints, Stopcocks, and Stoppers (Third Edition). The first edition of this commercial standard was published in 1930; experience has since demonstrated that interchangeability of mating parts, which has been responsible for many of the advances in the automotive and mechanical fields, is entirely practical for some types of glass apparatus. The scope of the first edition of the standard was confined entirely to interchangeable ground-glass joints; the second edition extended the principle to include stopcocks and flask and reagent bottle stoppers; the third edition retains all existing sizes of joints, stopcocks, and stoppers and adds two new sizes of full length joints and a series of medium length joints. In adding these new sizes and lengths, the standing committee was fully cognizant of the fact that, from the user's standpoint, as well as from that of the manufacturer, the variety of sizes must be kept at a minimum. Therefore, only those for which there is a known demand have been added.

As before, the standard requires that interchangeable ground-glass joints, stopcocks, and stoppers shall be identified by an ST symbol etched on each member of the joint, the symbol to be followed by a size designation and the trade mark of the manufacturer. The method of size designation of joints includes a number indicating the approximate diameter at the large end of the ground zone, followed by a second figure, separated from the first by a hyphen or diagonal, indicating the approximate length of the ground zone. The size designation for stopcocks is based on the diameter of the bore; for flask and bottle stoppers, on the diameter at the large end of the ground zone.

The standard covers 14 sizes of full-length interchangeable ground-glass joints and a series of 10 medium-length joints. The nine sizes of stopcocks, eight sizes of flask stoppers, and six sizes of reagent bottle stoppers covered by CS21–34 remain unchanged.

The standard also covers material and construction requirements for standard master plug and ring gages with dimensional tolerances, the required fit of mating gages with reference to each other, and fit of the finished product in working gages. The universal taper for all interchangeable ground-glass joints, stopcocks, and stoppers is 1 to 10, the specified length of the ground zone varying with the product.

The personnel of the standing committee is given in the printed pamphlet, together with a list of acceptors and a brief history of the project.

The standard became effective for new production on May 15, 1936. Copies of CS21–36 are obtainable at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

### COMMERCIAL STANDARD FOR MIRRORS

The Bureau has just released a second edition of its Commercial Standard CS27–36, for mirrors. The first edition of this commercial standard, entitled Plate Glass Mirrors, was published in 1930. The revised standard covers plate-glass mirrors and "shock" or common window-glass mirrors. Plate-glass mirrors are of three distinct grades designated as "A", no. 1, and no. 2 quality, based on the presence of certain defects which generally occur in existing grades of plate glass. Shock or common window-glass mirrors are manufactured in one quality only, based upon defects found in window glass. They are available in single strength, double strength, and heavy window glass. The standard covers thicknesses, silvering, quality designation, guarantee, and method of inspection. A glossary of terms is also provided for those unfamiliar with the trade terminology sometimes employed.

Experience of the industry under the provisions of the first edition of this standard indicated the desirability of eliminating AA and no. 3 quality plate-glass mirrors.

The first edition covered plate-glass mirrors only, while the second edition was extended to include "shock" or common window-glass mirrors.

The personnel of the standing committee is given in the printed pamphlet, together with a list of acceptors, and a brief history of the project.

The revised standard became effective for new production on August 20, 1936. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

### COMMERCIAL STANDARD FOR HOSIERY LENGTHS AND SIZES

Commercial Standard CS46–36, for hosiery lengths and sizes, which has just been released, was established to provide standard measurements and standard methods of measuring various types of hosiery as a basis of understanding among producers, distributors, and users of men's, women's, and children's hosiery. It is also intended to eliminate confusion resulting from a diversity of measurements and methods, and to provide a uniform basis for guaranteeing lengths and sizes of hosiery.

In women's hosiery, particularly, lengths other than standard are regularly available. However, unless mentioned in the order, it is understood that the seller will supply standard lengths and thus put an end to the former practice of a few manufacturers who furnished the shortest lengths except when the retailer ordered something else.

The specification covers methods of measuring lengths and sizes, and tolerances for: Ladies' full-fashioned, circular knit (seamless), and ribbed cotton hosiery; men's hosiery; boys' golf, children's and misses' ribbed, children's ⅝ flat knit, and children's ⅞ hosiery; infants' ribbed hosiery and children's socks. There are also included standard folded cuff lengths for infants' and children's anklets, boy's golf hosiery, and children's ⅞ hosiery.

There are included in this pamphlet the number of machine needles and the cylinder sizes upon which the lengths of the various types of children's stockings, infants' and children's socks, and boys' golf hosiery are based.

The pamphlet carries a brief history of the activities connected with the development of this specification and its establishment as a commercial standard. A list of official acceptors and a roster of the standing committee which was appointed by the general conference is also included. This committee considers suggestions and comment with a view to revision of the standard, when it appears necessary, to keep it abreast of progress in the industry.

The standard became effective July 20, 1936. Copies are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

### STANDARDS OF QUALITY

The following is an abstract of an address delivered on November 23, 1936, by Warren E. Emley, Chief of the Organic and Fibrous Materials Division, at the centennial celebration of the establishment of the American patent system. To establish and maintain standards of quality is one of several functions of the Bureau, specified in its organic act. At one time quality meant chemical composition, or some similar property which could be measured by the orthodox methods of science. But the over-the-counter buyer is insisting that a standard of quality shall have a more direct meaning—that it shall measure the value of the article for the purpose for which it is to be used. In certain cases the buyer might be able to obtain adequate information from the combination of a number of chemical and physical tests. But in general it is simpler to devise a performance test to indicate the probable behavior of the article in service.

Performance tests are being developed to meet this insistent and ever growing demand from the ultimate consumers. While based upon fundamental chemistry and physics, they are designed to measure the useful properties of the article as sold over the counter. The Bureau's progress in developing such tests is largely dependent upon the fact that members of its own staff are well trained in theoretical chemistry and physics.

Many such tests are now in regular daily use, developed with the cooperation of manufacturers. Several are already to be found in specifications.

The development of such methods is a fertile field for invention. The necessity of providing the retail buyer with some way to tell whether or not the dollar article is worth more than one which sells for 69 cents, is pressing.

Among such methods now in use may be cited tests for the durability in service of shoes, and tires, and hacksaw blades; the value of insulating materials against the passage of electricity, heat, or sound; the impact resistance and shatterability of windshields; the fastness of dyes to sunlight, laundering, and dry cleaning; the

fire resistance of a safe; and many others too numerous to mention.

A motion picture was then shown, illustrating a machine devised to test stockings for their ability to resist runs. Barring accidents, a run will start when the silk thread is stressed so many times as to become fatigued, so this machine merely measures the ability of the stocking to resist fatigue under tension. A good stocking will stand about 1,000 oscillations on this machine, a poor one may yield in 3, yet both may be disconcertingly similar in appearance, in cost of manufacture, and in cost to you.

## NEW AND REVISED PUBLICATIONS ISSUED DURING DECEMBER 1936

### Journal of Research[1]

Journal of Research of the National Bureau of Standards, title page and contents to volume 16, January to June, 1936 (RP857 to RP898, inclusive). Free on application to the Bureau.

Journal of Research of the National Bureau of Standards, volume 17, no. 6, December 1936 (RP946 to RP956, inclusive), with index to volume 17. Price 25 cents. Obtainable by subscription.

### Research Papers[1]

(Reprints from the July and September 1936 Journal of Research)

RP901. Intensity distribution in the line emission spectrum of cesium. Fred L. Mohler. Price 5 cents.

RP902. Solubility of calcium 2-methylbutyrate in water. David F. Houston. Price 5 cents.

RP913. Comparison of data on the ionosphere, sunspots, and terrestrial magnetism. Elbert B. Judson. Price 5 cents.

RP914. Preparation and properties of calcium lactobionate-calcium bromide. Horace S. Isbell. Price 5 cents.

RP915. Empirical relation between the atomic dimensions and the melting and sublimation points of the noble gases, halogens, and elements of the sulphur group. D. H. Brauns. Price 5 cents.

RP916. The French Sugar Scale. Frederick Bates and Francis P. Phelps. Price 5 cents.

RP917. Structural characteristics of some constituents of portland cement clinker. Herbert Insley. Price 5 cents.

RP918. Electrolytic measurement of the corrosiveness of soils. I. A. Denison. Price 5 cents.

RP919. Thermal control in minimum-deviation refractometry and temperature coefficients for a medium flint glass. Leroy W. Tilton. Price 5 cents.

RP920. Inspection and tensile tests of some worn wire ropes. Walter H. Fulweiler, Ambrose H. Stang, and Leroy R. Sweetman. Price 10 cents.

RP921. Ebulliometric and tonometric measurements on normal aliphatic hydrocarbons. Mieczysław Wojciechowski. Price 5 cents.

RP922. Boiling point of ethyl ether and its relation to pressure. Mieczysław Wojciechowski. Price 5 cents.

RP923. Young's modulus of elasticity, strength, and extensibility of refractories in tension. R. A. Heindl and L. E. Mong. Price 5 cents.

RP924. Ionization of air by Lenard rays. Lauriston S. Taylor. Price 5 cents.

### Simplified Practice Recommendations[1]

R11–36. Bed blanket sizes. (Supersedes R11.) Price 5 cents.

R90–36. Hack-saw blades. (Supersedes R90–29.) Price 5 cents.

R118–36. Abrasive grain sizes. (Supersedes R118–30.) Price 5 cents

R165–36. Photographic film for miniature copies of records. Price 5 cents.

### Commercial Standards[1]

CS20–36. Staple vitreous china plumbing fixtures. (Supersedes CS20–30.) Price 10 cents.

CS27–36. Mirrors. (Supersedes CS27–30.) Price 5 cents.

CS46–36. Hosiery lengths and sizes. (Supersedes CS46–33.) Price 5 cents.

### Technical News Bulletin[1]

Technical News Bulletin 236. December 1936, with index. Price 5 cents. Obtainable by subscription.

[1] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $2.50 per year (United States and its possessions, and Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama); other countries, 70 cents and $3.25, respectively.

[1] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $2.50 per year (United States and its possessions, and Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama); other countries, 70 cents and $3.25, respectively.

## MIMEOGRAPHED MATERIAL

### Letter Circulars

Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards, and are sent only on request to persons having definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or to send copies automatically as issued.

LC481. Color charts. (List and description of color charts issued or used by branches of the U. S. Government, also list and description of color charts used for general purposes.) (Supersedes LC358.)

LC482. Railway track scale testing service of the National Bureau of Standards, fiscal year 1936 (July 1, 1935, to June 30, 1936).

LC483. Classification of acoustic materials.

LC484. Floor-covering materials: Performance test.

LC485. Publications of the National Bureau of Standards relating to optical instruments, refractometry, and optical glass.

### Technical Information on Building Materials

The supply of these notes, each of which consists of three or four pages giving the important facts on some one aspect of the properties or use of building materials, is necessarily limited. Their distribution will be confined to Government officials concerned with building projects, and to architects, engineers, and home builders. Requests should make clear the actual need for the information at the time of writing. Letters should be addressed to the Division of Codes and Specifications, National Bureau of Standards, Washington, D. C. The following notes have been issued since the list published in the November 1936 number of the Technical News Bulletin:

TIBM–41. Roofing tin (terne plate) for house construction.

TIBM–42. "Black" and galvanized sheets for use in house construction.

## RECENT BUREAU ARTICLES APPEARING IN OUTSIDE PUBLICATIONS[2]

United States and British units of weights and measures. Henry W. Bearce. Scientific Mo. (Grand Central Terminal, New York, N. Y.) **43,** 566 (December 1936).

Thermal expansion of copper-beryllium alloys. Peter Hidnert. Metal Industry (London, England) **49,** 212 (August 28, 1936).

Photoelectric photometers and colorimeters. Kasson S. Gibson. Instruments (1117 Wolfendale Street, Pittsburgh, Pa.) **9,** 309 and 335 (November and December 1936).

Review of Professor W. Swietoslawski's book on ebulliometry. E. R. Smith. J. Am. Chem. Soc. (Mills Building, Washington, D. C.) **58,** 2345 (1936).

Mechanical properties of aluminum alloy rivets. Wm. C. Brueggeman. Nat. Advisory Com. Aero. (Washington, D. C.), Technical Note no. 585.

Air flow in the boundary layer near a plate. Hugh L. Dryden. Nat. Advisory Com. Aero. Technical Report no. 562. (Obtainable at 10 cents per copy from the Superintendent of Documents, Government Printing Office, Washington, D. C.)

Properties and serviceability of silk dress fabrics. R. K. Worner. Rayon Textile Mo. (303 Fifth Avenue, New York, N. Y.) **17,** 683 and 723 (October and November 1936).

Air conditioning requirements of multicolor offset printing. C. G. Weber. Refrigerating Eng. (37 West Thirty-ninth Street, New York, N. Y.) **32,** 393 (December 1936).

When are old buildings unsafe? G. N. Thompson. Ind. Standardization and Com. Stds. Mo. (29 W. Thirty-ninth Street, New York, N. Y.) **7,** 285 (November 1936).

[2] These publications are not obtainable from the Government, unless otherwise stated. Requests should be sent direct to the publishers.

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